

SEQUENCE LISTING

(1) GENERAL INFORMATION:

(i) APPLICANT:

- (A) NAME: E. I. DUPONT DE NEMOURS AND COMPANY
- (B) STREET: 1007 MARKET STREET
- (C) CITY: WILMINGTON
- (D) STATE: DELAWARE
- (E) COUNTRY: U.S.A.
- (F) POSTAL CODE (ZIP): 19898
- (G) TELEPHONE: 302-892-8112
- (H) TELEFAX: 302-773-0164

(i) APPLICANT:

- (A) NAME: GENENCOR INTERNATIONAL, INC.
- (B) STREET: 4 CAMBRIDGE PLACE
1870 SOUTH WINTON ROAD
- (C) CITY: ROCHESTER
- (D) STATE: NEW YORK
- (E) COUNTRY: U.S.A.
- (F) POSTAL CODE (ZIP): 14618
- (G) TELEPHONE:
- (H) TELEFAX:

(ii) TITLE OF INVENTION: BIOCONVERSION OF A FERMENTABLE CARBON SOURCE TO 1,3-PROPANE-DIOL BY A SINGLE MICROORGANISM

(iii) NUMBER OF SEQUENCES: 46

(iv) COMPUTER READABLE FORM:

- (A) MEDIUM TYPE: 3.50 INCH DISKETTE
- (B) COMPUTER: IBM
- (C) OPERATING SYSTEM: MICROSOFT WINDOWS 3.1
- (D) SOFTWARE: MICROSOFT WORD 6.0

(v) CURRENT APPLICATION DATA:

- (A) APPLICATION NUMBER:
- (B) FILING DATE:
- (C) CLASSIFICATION:

(vi) PRIOR APPLICATION DATA:

- (A) APPLICATION NUMBER: 08/440,293
- (B) FILING DATE: MAY 12, 1995

(vii) ATTORNEY/AGENT INFORMATION:

- (A) NAME: LINDA AXAMETHY FLOYD
- (B) REGISTRATION NUMBER: 33,692
- (C) REFERENCE/DOCKET NUMBER: CR-9715-B

(2) INFORMATION FOR SEQ ID NO:1:

(i) SEQUENCE CHARACTERISTICS:

- (A) LENGTH: 12145 base pairs
- (B) TYPE: nucleic acid
- (C) STRANDEDNESS: single
- (D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA (genomic)

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:1:

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ACAGGCGCCG GAGAGCATGC CCTGGCCGAT ATAGCCGCAG TGCATCGGTT CATGTCCGCT	240
GCCGCCGCCG GAGAGCAGGG CCACCTTGCC AGCCACCGGC GCGTCGGTGC GGGTCACATA	300
CAGCGGGTCC TGATGCAGGG TCAGCTGCAG ATGGGCTTTA GCCAGCCCCT GTAATTGTT	360
ATTCAGTACA TCTTCAACAC GGTTAACAG CTTTTCATC ATTCAAGTGCT CCGTTGGAGA	420
AGGTTCGATG CCGCCTCTCT GCTGGCGGAG GCGGTCATCG CGTAGGGGTA TCGTCTGACG	480
GTGGAGCGTG CCTGGCGATA TGATGATTCT GGCTGAGCGG ACGAAAAAAA GAATGCCCG	540
ACGATCGGGT TTCATTACGA AACATTGCTT CCTGATTTTG TTTCTTATG GAACGTTTTT	600
GCTGAGGATA TGGTAAAAAT GCGAGCTGGC GCGCTTTTT TCTTCTGCCA TAAGCGGCGG	660
TCAGGATAGC CGGCGAACGCG GGTGGGAAAA AATTTTTGC TGATTTCTG CCGACTGCAG	720
GAGAAAAGGC GGTCAAACAC GGAGGATTGT AAGGGCATTA TGCGGCAAAG GAGCGGATCG	780
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CCTGTGTTTC ATATCAGAAC AAAAAGGCAG AAGATTTTT TGTTCCCTGC CGGCCCTACA	900
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CGCCAGGGCT CATCATGTCT ACATGCGCAC TTATTTGAGG GTGAAAGGAA TGCTAAAAGT	1020
TATTCAATCT CCAGCCAAT ATCTTCAGGG TCCTGATGCT GCTGTTCTGT TCGGTCAATA	1080
TGCCAAAAAC CTGGCGGAGA GCTTCTCGT CATCGCTGAC GATTCGTAA TGAAGCTGGC	1140
GGGAGAGAAA GTGGTGAATG GCCTGCAGAG CCACGATATT CGCTGCCATG CGGAACGGTT	1200
TAACGGCGAA TGCAGCCATG CGGAAATCAA CCGTCTGATG GCGATTTGC AAAAACAGGG	1260
CTGCCCGGC GTGGTCGGGA TCGGCGGTGG TAAAACCCCTC GATACCGCGA AGGCGATCGG	1320
TTACTACCAG AAGCTGCCGG TGGTGGTGAT CCCGACCATC GCCTCGACCG ATGCGCCAAC	1380

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GAAAAACCCG	GATATGGTGG	TGATGGACAC	GGCGATTATC	GCCAAAGCGC	CGGTACGCCT	1500
GCTGGTCTCC	GGCATGGCG	ATGCGCTCTC	CACCTGGTTC	GAGGCCAAAG	CTTGCTACGA	1560
TGCGCGGCC	ACCAGCATGG	CCGGAGGACA	GTCCACCGAG	GC GGCGCTGA	GCCTCGCCCC	1620
CCTGTGCTAT	GATACGCTGC	TGGCGGAGGG	CGAAAAGGCC	CGTCTGGCGG	CGCAGGCCGG	1680
GGTAGTGACC	GAAGCGCTGG	AGCGCATCAT	CGAGGCGAAC	ACTTACCTCA	GCGGCATTGG	1740
CTTTGAAAGC	AGTGGCCTGG	CCGCTGCCCA	TGCAATCCAC	AACGGTTCA	CCATTCTTGA	1800
AGAGTGCCAT	CACCTGTATC	ACGGTGAGAA	AGTGGCCTTC	GGTACCCCTGG	CGCAGCTGGT	1860
GCTGCAGAAC	AGCCCAGATGG	ACGAGATTGA	AACGGTGCAG	GGCTTCTGCC	AGCGCGTCGG	1920
CCTGCCGGTG	ACGCTCGCGC	AGATGGCGT	CAAAGAGGGG	ATCGACGAGA	AAATCGCCGC	1980
GGTGGCGAAA	GCTACCTGCG	CGGAAGGGGA	AACCATCCAT	AATATGCCGT	TTGCCGTGAC	2040
CCCGGAGAGC	GTCCATGCCG	CTATCCTCAC	CGCCGATCTG	TTAGGCCAGC	AGTGGCTGGC	2100
GCGTTAACCC	GCGGTGGCTA	AACCGCTGGC	CCAGGTCAGC	GGTTTTCTT	TCTCCCTCC	2160
GGCAGTCGCT	GCCGGAGGGG	TTCTCTATGG	TACAACGCGG	AAAAGGATAT	GAUTGTTCA	2220
ACTCAGGATA	CCGGGAAGGC	GGTCTCTTC	GTCATTGCC	AGTCATGGCA	CCGCTGCAGC	2280
AAGTTTATGC	AGCGCGAAAC	CTGGCAAACG	CGCGACCAGG	CCCAGGGCCT	GACCTTCGAC	2340
TCCATCTGTC	GGCGTAAAC	CGCGCTGCTC	ACCATCGGCC	AGGCAGCGCT	GGAAGACGCC	2400
TGGGAGTTA	TGGACGGCCG	CCCCTGCGCG	CTGTTTATT	TTGATGAGTC	CGCCTGCATC	2460
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GGCAGCTATT	GTGCGGAGAG	CATTATCGGC	ACCTGCGCGC	TGTCGCTGGC	CGCGATGCAG	2580
GGCCAGCCGA	TCAACACCGC	CGGCGATCGG	CATTTAACG	AGGCAGCTACA	GCCATGGAGT	2640
TTTGCTCGA	CGCCGGTGT	TGATAACCAC	GGGCGGCTGT	TCGGCTCTAT	CTCGCTTTGC	2700
TGTCTGGTCG	AGCACCCAGTC	CAGCGCCGAC	CTCTCCCTGA	CGCTGGCCAT	CGCCCGCGAG	2760
GTGGGTAACT	CCCTGCTTAC	CGACAGCCTG	CTGGCGGAAT	CCAACCGTCA	CCTCAATCAG	2820
ATGTACGGCC	TGCTGGAGAG	CATGGACGAT	GGGGTGATGG	CGTGGAACGA	ACAGGGCGTG	2880
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GGGAAAATA	TCGCCGATCT	GGTGACCCCTC	CCGGCGCTGC	TGCGCCGCGC	CATCAAACAC	3000
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GTGATCACCT	AAAAACCGAT	TGTCGAGGCG	CAAGGCAACA	GTTTATTCT	GCTGCTGCAT	3120

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TCGAGGTGGT	GAGTGCCTGC	AACGACATCA	ATGACTATCA	GGGGCCGGGC	ACCGGCTATC	8640
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CTGACCGACG ACGGCAACGG AATTC 12145

(2) INFORMATION FOR SEQ ID NO:2:

- (i) SEQUENCE CHARACTERISTICS:
(A) LENGTH: 30 base pairs
(B) TYPE: nucleic acid
(C) STRANDEDNESS: single
(D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA (genomic)

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:2:

GGGAATTCAT GAAAAGATCA AAACGATTG 30

(2) INFORMATION FOR SEQ ID NO:3:

- (i) SEQUENCE CHARACTERISTICS:
(A) LENGTH: 29 base pairs
(B) TYPE: nucleic acid
(C) STRANDEDNESS: single
(D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA (genomic)

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:3:

GCGAATTCTT ATTCAATGGT GTCGGGCTG 29

(2) INFORMATION FOR SEQ ID NO:4:

- (i) SEQUENCE CHARACTERISTICS:
(A) LENGTH: 30 base pairs
(B) TYPE: nucleic acid
(C) STRANDEDNESS: single
(D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA (genomic)

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:4:

GCGAATTCAT GCAACAGACA ACCCAAATTC 30

(2) INFORMATION FOR SEQ ID NO: 5:

- (i) SEQUENCE CHARACTERISTICS:
(A) LENGTH: 25 base pairs

- (B) TYPE: nucleic acid
- (C) STRANDEDNESS: single
- (D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA (genomic)

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:5:

GCGAATTACAC TCCCTTACTA AGTCG

25

(2) INFORMATION FOR SEQ ID NO: 6:

- (i) SEQUENCE CHARACTERISTICS:
- (A) LENGTH: 27 base pairs
- (B) TYPE: nucleic acid
- (C) STRANDEDNESS: single
- (D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA (genomic)

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:6:

GCGAATTACAT GAGCTATCGT ATGTTTG

27

(2) INFORMATION FOR SEQ ID NO:7:

- (i) SEQUENCE CHARACTERISTICS:
- (A) LENGTH: 28 base pairs
- (B) TYPE: nucleic acid
- (C) STRANDEDNESS: single
- (D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA (genomic)

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:7:

GCGAATTACAG AATGCCTGGC GGAAAATC

28

(2) INFORMATION FOR SEQ ID NO:8:

- (i) SEQUENCE CHARACTERISTICS:
- (A) LENGTH: 28 base pairs
- (B) TYPE: nucleic acid
- (C) STRANDEDNESS: single
- (D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA (genomic)

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:8:

GGGAATTACAT GAGCGAGAAA ACCATGCG

28

(2) INFORMATION FOR SEQ ID NO:9:

- (i) SEQUENCE CHARACTERISTICS:
- (A) LENGTH: 27 base pairs
- (B) TYPE: nucleic acid

(C) STRANDEDNESS: single
(D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA (genomic)

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:9:

GCGAATTCTT AGCTTCCTTT ACGCAGC

27

(2) INFORMATION FOR SEQ ID NO:10:

(i) SEQUENCE CHARACTERISTICS:
(A) LENGTH: 94 base pairs
(B) TYPE: nucleic acid
(C) STRANDEDNESS: single
(D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA (genomic)

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:10:

AGCTTAGGAG TCTAGAATAT TGAGCTCGAA TTCCCGGGCA TGCGGTACCG GATCCAGAAA

60

AAAGCCCGCA CCTGACAGTG CGGGCTTTTT TTTT

94

(2) INFORMATION FOR SEQ ID NO:11:

(i) SEQUENCE CHARACTERISTICS:
(A) LENGTH: 33 base pairs
(B) TYPE: nucleic acid
(C) STRANDEDNESS: single
(D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA (genomic)

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:11:

GGCCAAGCTT AAGGAGGTTA ATTAAATGAA AAG

33

(2) INFORMATION FOR SEQ ID NO:12:

(i) SEQUENCE CHARACTERISTICS:
(A) LENGTH: 26 base pairs
(B) TYPE: nucleic acid
(C) STRANDEDNESS: single
(D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA (genomic)

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:12:

GCTCTAGATT ATTCAATGGT GTCGGG

26

(2) INFORMATION FOR SEQ ID NO:13:

(i) SEQUENCE CHARACTERISTICS:
(A) LENGTH: 42 base pairs
(B) TYPE: nucleic acid

(C) STRANDEDNESS: single
(D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA (genomic)

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:13:

GCGCCGTCTA GAATTATGAG CTATCGTATG TTTGATTATC TG

42

(2) INFORMATION FOR SEQ ID NO:14:

(i) SEQUENCE CHARACTERISTICS:
(A) LENGTH: 36 base pairs
(B) TYPE: nucleic acid
(C) STRANDEDNESS: single
(D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA (genomic)

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:14:

TCTGATAACGG GATCCTCAGA ATGCCTGGCG GAAAAT

36

(2) INFORMATION FOR SEQ ID NO:15:

(i) SEQUENCE CHARACTERISTICS:
(A) LENGTH: 181 base pairs
(B) TYPE: nucleic acid
(C) STRANDEDNESS: single
(D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA (genomic)

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:15:

CGATCTGTGC TGTTTGCCAC GGTATGCAGC ACCAGCGCGA GATTATGGGC TCGCACGCTC

60

GACTGTCGGA CGGGGGCACT GGAACGAGAA GTCAGGCGAG CCGTCACGCC CTTGACAATG

120

CCACATCCTG AGCAAATAAT TCAACCCTA AACAAATCAA CCGCGTTTCC CGGAGGTAAC

180

C

181

(2) INFORMATION FOR SEQ ID NO:16:

(i) SEQUENCE CHARACTERISTICS:
(A) LENGTH: 149 base pairs
(B) TYPE: nucleic acid
(C) STRANDEDNESS: single
(D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA (genomic)

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:16:

CGATCTGTGC TGTTTGCCAC GGTATGCAGC ACCAGCGCGA GATTATGGGC TCGCACGCTC

60

GACTGTCGGA CGGGGGCACT GGAACATGCC ACATCCTGAG CAAATAATTC AACCACTAAA

120

CAAATCAACC GCGTTCCCCG GAGGTAACC

149

(2) INFORMATION FOR SEQ ID NO:17:

- (i) SEQUENCE CHARACTERISTICS:
(A) LENGTH: 33 base pairs
(B) TYPE: nucleic acid
(C) STRANDEDNESS: single
(D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA (genomic)

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:17:

GGAATTCACT AGTCGATCTG TGCTGTTGC CAC

33

(2) INFORMATION FOR SEQ ID NO:18:

- (i) SEQUENCE CHARACTERISTICS:
(A) LENGTH: 33 base pairs
(B) TYPE: nucleic acid
(C) STRANDEDNESS: single
(D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA (genomic)

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:18:

GGGAAAGCTT GGTTACCTCC GGGAAACGCG GTT

33

(2) INFORMATION FOR SEQ ID NO:19:

- (i) SEQUENCE CHARACTERISTICS:
(A) LENGTH: 16 base pairs
(B) TYPE: nucleic acid
(C) STRANDEDNESS: single
(D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA (genomic)

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:19:

TCGACCACAA GGAGGA

16

(2) INFORMATION FOR SEQ ID NO:20:

- (i) SEQUENCE CHARACTERISTICS:
(A) LENGTH: 16 base pairs
(B) TYPE: nucleic acid
(C) STRANDEDNESS: single
(D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA (genomic)

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:20:

CTAGTCCTCC TTGTGG

16

(2) INFORMATION FOR SEQ ID NO:21:

- (i) SEQUENCE CHARACTERISTICS:
(A) LENGTH: 45 base pairs
(B) TYPE: nucleic acid
(C) STRANDEDNESS: single
(D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA (genomic)

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:21:

ACTGGCCGTC GTTTACTCG AGTCGTGACT GGGAAAACCC TGGCG

45

(2) INFORMATION FOR SEQ ID NO:22:

- (i) SEQUENCE CHARACTERISTICS:
(A) LENGTH: 14 base pairs
(B) TYPE: nucleic acid
(C) STRANDEDNESS: single
(D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA (genomic)

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:22:

AATTCAAAGG AGGT

14

(2) INFORMATION FOR SEQ ID NO:23:

- (i) SEQUENCE CHARACTERISTICS:
(A) LENGTH: 14 base pairs
(B) TYPE: nucleic acid
(C) STRANDEDNESS: single
(D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA (genomic)

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:23:

CTAGACCTCC TTTG

14

(2) INFORMATION FOR SEQ ID NO:24:

- (i) SEQUENCE CHARACTERISTICS:
(A) LENGTH: 19 base pairs
(B) TYPE: nucleic acid
(C) STRANDEDNESS: single
(D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA (genomic)

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:24:

AGCTTGTGCA CCATGAAAA

19

(2) INFORMATION FOR SEQ ID NO:25:

(i) SEQUENCE CHARACTERISTICS:
(A) LENGTH: 19 base pairs
(B) TYPE: nucleic acid
(C) STRANDEDNESS: single
(D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA (genomic)

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:25:

GATCTTTCA TGGTCGACA

19

(2) INFORMATION FOR SEQ ID NO:26:

(i) SEQUENCE CHARACTERISTICS:
(A) LENGTH: 13 base pairs
(B) TYPE: nucleic acid
(C) STRANDEDNESS: single
(D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA (genomic)

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:26:

TCGACCAGGA GGA

13

(2) INFORMATION FOR SEQ ID NO:27:

(i) SEQUENCE CHARACTERISTICS:
(A) LENGTH: 13 base pairs
(B) TYPE: nucleic acid
(C) STRANDEDNESS: single
(D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA (genomic)

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:27:

CTAGTCCTCC TGG

13

(2) INFORMATION FOR SEQ ID NO:28:

(i) SEQUENCE CHARACTERISTICS:
(A) LENGTH: 18 base pairs
(B) TYPE: nucleic acid
(C) STRANDEDNESS: single
(D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA (genomic)

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:28:

TCGACGAATT CAGGAGGA

18

(2) INFORMATION FOR SEQ ID NO:29:

- (i) SEQUENCE CHARACTERISTICS:
(A) LENGTH: 18 base pairs
(B) TYPE: nucleic acid
(C) STRANDEDNESS: single
(D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA (genomic)

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:29:

CTAGTCCTCC TGAATTCG

18

(2) INFORMATION FOR SEQ ID NO:30:

- (i) SEQUENCE CHARACTERISTICS:
(A) LENGTH: 23 base pairs
(B) TYPE: nucleic acid
(C) STRANDEDNESS: single
(D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA (genomic)

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:30:

ATGTACAAGA TCCTGATCGC CGA

23

(2) INFORMATION FOR SEQ ID NO:31:

- (i) SEQUENCE CHARACTERISTICS:
(A) LENGTH: 22 base pairs
(B) TYPE: nucleic acid
(C) STRANDEDNESS: single
(D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA (genomic)

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:31:

TCAGCGGCGC AGGTAGGCGG CG

22

(2) INFORMATION FOR SEQ ID NO:32:

- (i) SEQUENCE CHARACTERISTICS:
(A) LENGTH: 31 base pairs
(B) TYPE: nucleic acid
(C) STRANDEDNESS: single
(D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA (genomic)

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:32:

ATGACCAAGG GCCGGATCCG TCGACCTGCA G

31

(2) INFORMATION FOR SEQ ID NO:33:

(i) SEQUENCE CHARACTERISTICS:
(A) LENGTH: 32 base pairs
(B) TYPE: nucleic acid
(C) STRANDEDNESS: single
(D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA (genomic)

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:33:

CTACCCATTGG CCCCCGGATCC GTCGACCTGC AG

32

(2) INFORMATION FOR SEQ ID NO:34:

(i) SEQUENCE CHARACTERISTICS:
(A) LENGTH: 23 base pairs
(B) TYPE: nucleic acid
(C) STRANDEDNESS: single
(D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA (genomic)

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:34:

CACGGCCTGG CGCAGGTTGC GGG

23

(2) INFORMATION FOR SEQ ID NO:35:

(i) SEQUENCE CHARACTERISTICS:
(A) LENGTH: 21 base pairs
(B) TYPE: nucleic acid
(C) STRANDEDNESS: single
(D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA (genomic)

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:35:

GGCAGCCCGC ACGATTGCGG C

21

(2) INFORMATION FOR SEQ ID NO:36:

(i) SEQUENCE CHARACTERISTICS:
(A) LENGTH: 21 base pairs
(B) TYPE: nucleic acid
(C) STRANDEDNESS: single
(D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA (genomic)

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:36:

GCGGAAAACC GCCTGGATCG C

21

(2) INFORMATION FOR SEQ ID NO:37:

- (i) SEQUENCE CHARACTERISTICS:
(A) LENGTH: 21 base pairs
(B) TYPE: nucleic acid
(C) STRANDEDNESS: single
(D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA (genomic)

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:37:

GGGTTTCAGGG ACTGCAAAAC G

21

(2) INFORMATION FOR SEQ ID NO:38:

- (i) SEQUENCE CHARACTERISTICS:
(A) LENGTH: 35 base pairs
(B) TYPE: nucleic acid
(C) STRANDEDNESS: single
(D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA (genomic)

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:38:

GGAATTCAGA TCTCAGCAAT GAAAAGATCA AAACG

35

(2) INFORMATION FOR SEQ ID NO:39:

- (i) SEQUENCE CHARACTERISTICS:
(A) LENGTH: 34 base pairs
(B) TYPE: nucleic acid
(C) STRANDEDNESS: single
(D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA (genomic)

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:39:

GGAATTCAGA TCTCAGCAAT GCAACAGACA ACCC

34

(2) INFORMATION FOR SEQ ID NO:40:

- (i) SEQUENCE CHARACTERISTICS:
(A) LENGTH: 28 base pairs
(B) TYPE: nucleic acid
(C) STRANDEDNESS: single
(D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA (genomic)

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:40:

GCTCTAGATC ACTCCCCCTTA CTAAGTCG

28

(2) INFORMATION FOR SEQ ID NO:41:

- (i) SEQUENCE CHARACTERISTICS:
(A) LENGTH: 37 base pairs
(B) TYPE: nucleic acid
(C) STRANDEDNESS: single
(D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA (genomic)

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:41:

GGAATTCAGA TCTCAGCAAT GAGCGAGAAA ACCATGC

37

(2) INFORMATION FOR SEQ ID NO:42:

- (i) SEQUENCE CHARACTERISTICS:
(A) LENGTH: 27 base pairs
(B) TYPE: nucleic acid
(C) STRANDEDNESS: single
(D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA (genomic)

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:42:

GCTCTAGATT AGCTTCCTTT ACGCAGC

27

(2) INFORMATION FOR SEQ ID NO:43:

- (i) SEQUENCE CHARACTERISTICS:
(A) LENGTH: 38 base pairs
(B) TYPE: nucleic acid
(C) STRANDEDNESS: single
(D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA (genomic)

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:43:

GGAATTCAGA TCTCAGCAAT GAGCTATCGT ATGTTTGA

38

(2) INFORMATION FOR SEQ ID NO:44:

- (i) SEQUENCE CHARACTERISTICS:
(A) LENGTH: 24 base pairs
(B) TYPE: nucleic acid
(C) STRANDEDNESS: single
(D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA (genomic)

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:44:

GCTCTAGATC AGAATGCCTG GCGG

24

(2) INFORMATION FOR SEQ ID NO:45:

- (i) SEQUENCE CHARACTERISTICS:
(A) LENGTH: 35 base pairs
(B) TYPE: nucleic acid
(C) STRANDEDNESS: single
(D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA (genomic)

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:45:

GGAATTCAGA TCTAGCAATG CCGTTAACAG CCGGG

35

(2) INFORMATION FOR SEQ ID NO:46:

- (i) SEQUENCE CHARACTERISTICS:
(A) LENGTH: 26 base pairs
(B) TYPE: nucleic acid
(C) STRANDEDNESS: single
(D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA (genomic)

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:46:

GCTCTAGATT AATTGCCCTG ACCGGC

26

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